

values. It is essential that the impedance synthesis circuit described in this configuration supply the current based impedance close to the transmission feed line, otherwise the latency would disturb the actual signals being sent and received.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed and desired to be secured by United States Letters Patent is:

1. A stylus antenna structure connected to a transmission feed line on a digital device, the stylus antenna structure comprising:

- a radiator element for receiving and transmitting electromagnetic energy, the radiator element having an extended and a retracted position;
- a termination module located within the digital device electrically connected to the radiator element and the transmission feed line, the termination module synthesizing a termination impedance for optimal power transfer between the transmission feed line and the radiator element; and
- a stylus comprising a molded tip and a non-conductive cylinder with an upper and lower end, the molded tip used predominately for data entry on a touch sensitive screen on the digital device and the non-conductive cylinder protecting the radiator element located substantially within the non-conductive cylinder in the retracted position, the stylus being formed to selectively mechanically couple with the digital device via the insertion into a stylus socket on the digital device such that the stylus socket aligns the stylus to electrically couple the radiator element to the termination module.

2. The stylus antenna structure as recited in claim 1, wherein a first stylus antenna comprises the radiator element and the stylus, the first stylus antenna can be replaced with a second stylus antenna, wherein the first stylus antenna is tuned for use with a first wireless protocol and the second stylus antenna is tuned for use with a second wireless protocol.

3. The stylus antenna structure as recited in claim 1, wherein the retracted position is any position less than the extended position.

4. The stylus antenna structure as recited in claim 3, wherein the termination module only synthesizes the termination impedance for optimal power transfer between the transmission feed line and the radiator element in the retracted position.

5. The stylus antenna structure as recited in claim 1, wherein the stylus antenna structure further comprises:

- an upper metal sleeve attached to the upper end of the non-conductive cylinder, the upper metal sleeve being electrically connected to the radiator element in the extended position and selectively electrically coupled to the digital device when the stylus is mechanically coupled to the digital device; and
- a lower metal sleeve attached to the lower end of the non-conductive cylinder, the lower metal sleeve being electrically connected to the termination module, the radiator element in the retracted position, and selec-

tively electrically coupled to the digital device when the stylus is mechanically coupled to the digital device.

6. The stylus antenna structure as recited in claim 1, wherein the stylus antenna structure further comprises:

- a lower connection clip in electrical communication with the radiator element in the retracted position, the lower connection clip being selectively electrically coupled to a lower conductive clip on the digital device; and
- an upper connection clip in electrical communication with the radiator element in the extended position, the upper connection clip being selectively electrically coupled to an upper conductive clip on the digital device.

7. A stylus antenna for use with a wireless enabled digital device, the digital device having an antenna interface with a characteristic impedance, the stylus antenna comprising:

- a stylus facilitating data entry to the digital device, the stylus selectively coupling with a stylus socket on the digital device that electrically aligns the antenna interface with the stylus;
- a radiator element to transmit and receive electromagnetic energy in the form of radio waves with the antenna interface, the radiator element having an extended position with an extended impedance tuned for the antenna interface to maximize the available power for radiation and a retracted position with a retracted impedance, the radiator element being operably attached to the stylus; and
- an impedance synthesis module that generates a compensation impedance to be electrically combined with the retracted impedance of the radiator element in the retracted position creating an impedance combination that matches the characteristic impedance of the antenna interface so as to maximize the available power for radiation when the radiator element is in the retracted position.

8. The stylus antenna as recited in claim 7, wherein the radiator element is frequency independent to provide equal transceiving performance over a broad frequency band.

9. The stylus antenna as recited in claim 7, wherein the retracted position is any radiator element position less than the extended position and the retracted impedance varies according to the retracted position.

10. The stylus antenna as recited in claim 9, further comprising a position detection module connected to the stylus and radiator element, the position detection module for determining an actual position of the radiator element and transmitting the actual position to the impedance synthesis module.

11. The stylus antenna as recited in claim 10, wherein the impedance synthesis module further comprises a processor and a voltage controlled variable LC circuit impedance source, the processor receiving the actual position, calculating the compensation impedance, and sending a corresponding voltage to the impedance source for generating the compensation impedance.

12. The stylus antenna as recited in claim 10, wherein the impedance synthesis module and the position detection module comprises a potentiometer tuned to generate the compensation impedance based on the received actual position of the radiator element.

13. The stylus antenna as recited in claim 10, wherein the position detection module comprises:

- a magnet on the radiating element that moves when the radiating element is extended or retracted; and
- magnetic sensors positioned next to the radiating element to detect the position of the magnet.